Number 13 Series 1926

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
In Cooperation with the University of Wyoming Agricultural Experiment Station

SOIL SURVEY
OF
THE WHEATLAND AREA, WYOMING

BY

E. J. CARPENTER, in Charge, and E. G. FITZPATRICK, U. S. Department of Agriculture, and T. J. DUNNEWALD and CARL PEARSON
Wyoming Agricultural Experiment Station

Beginning with the 1923 Series, Soil Survey Reports have been issued separately. The reports of the individual areas are sent to libraries as soon as they are available and should be filed, preserved, and ultimately bound to take the place of the bound volumes of the Field Operations which were formerly supplied by the department. The reports for each year are consecutively numbered, the last report for a particular year bearing the conspicuous notice: "This number is the last Soil Survey Report for the Year 192–."

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 20 cents

BUREAU OF CHEMISTRY AND SOILS

HENRY G. KNIGHT, *Chief*

A. G. McCALL, *Chief, Soil Investigations*

SYDNEY FRISSELL, *Editor in Chief*

SOIL SURVEY

CURTIS F. MARBUT, *in Charge*

T. D. RICE, *Inspector, District 3*

COOPERATION

UNIVERSITY OF WYOMING AGRICULTURAL EXPERIMENT STATION

J. A. HILL, *Director*

A. F. VASS, *Head, Division of Agronomy*

CONTENTS

SOIL SURVEY OF THE WHEATLAND AREA, WYOMING[1]

By E. J. CARPENTER, in Charge, and E. G. FITZPATRICK, U. S. Department of Agriculture, and T. J. DUNNEWALD and CARL PEARSON, Wyoming Agricultural Experiment Station

AREA SURVEYED

The Wheatland area is in southeastern Wyoming, nearly midway between Cheyenne and Casper, on a line of the Colorado & Southern Railway running from Denver, Colo., to Billings, Mont. This line connects with the Union Pacific Railroad at Cheyenne and the Chicago & North Western and the Chicago, Burlington & Quincy 40 miles north of the area. The area surveyed lies around the town of Wheatland, most of it being south and west of that place. The map covers, roughly, an area extending 20 miles east and west, and 22 miles north and south. Laramie River, North Laramie River, Sibylee Creek, and Chugwater Creek, all of which bring drainage waters from the Laramie Mountains down to North Platte River, which is about 15 miles north of the Wheatland area, join within the area. The area includes 234,240 acres, or 366 square miles.

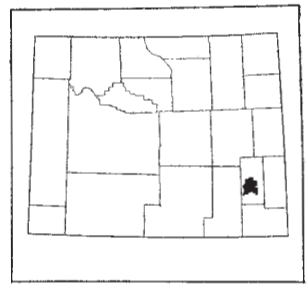


FIGURE 1.—Sketch map showing location of the Wheatland area, Wyoming

The Wheatland area lies on the east slope of the Laramie Mountains, which are outliers of the Rocky Mountains. Topographically, this district is part of the high plains area where the soil materials were laid down as sediments accumulated through erosion of the mountainous areas to the west. Subsequent erosion and weathering have cut channels and valleys across this plain, and a blanket of more recent sediments, which are the products of glacial action in the mountains, has been spread in a fan-shaped outwash or delta, covering the area from Chugwater Creek westward to the mountains.

East of Chugwater Creek and in the northeast corner of the area, the older Brule and Arikaree formations are exposed at the surface and are the parent materials of the soils. Eastward from this creek is a succession of steps or benches commonly known as catsteps. These benches or steps of brownish soil mixed with gravel and cobblestones, or having subsoils of these materials, are derived largely from the granitic rocks of the mountains, which have been ground off by weathering and glaciation. The resultant material has been spread out in the valley by the flood waters of the streams. The benches are crossed by the valley of Sibylee Creek and interrupted

[1] Report written by T. J. Dunnewald.

93268—30——1

by a ridge of Sibylee rocks, a projecting monadnock or saw-toothed ridge of hard granite rock which erosion has not reduced to the general level of the high plains. These rocks cover an area of about 7 or 8 square miles on the north edge of T. 23 N., R. 69 W., on the west side of Sibylee Creek.

The main irrigated part of the Wheatland area is bounded on the east by Chugwater Creek, on the north by Laramie River, and on the west by Sibylee Creek. To the south is rolling foothill country too rough for cultivation. Here the soil material is derived from a gravelly conglomerate.

The bottom lands along the streams are narrow, averaging perhaps one-half mile in width. They are composed of low terraces, border slopes, and true bottom land subject to overflow by the streams. These lands were the first to be irrigated and formed the basis of the larger cattle ranches which operated here before water was applied to the upper bench lands.

The elevation at Wheatland is 4,738 feet above sea level. The general slope of the area surveyed is to the north and northeast. Natural drainage is good, owing to the large number of creeks, the sloping and undulating relief of the benches, and the gravelly texture of the subsoils. Nearly every farm has an outlet for drainage and waste irrigation waters. The only wet areas are the bottom lands and narrow flats which receive seepage from the canals or from higher irrigated lands. Such areas are likely to occur at the margin between two bench levels.

Chugwater Creek, the smallest of the more important streams, becomes very low in midsummer when the maximum amount of water is being removed for irrigation but seldom goes entirely dry. The other streams are all perennial and furnish the livestock with water throughout the year. Water is also obtained from shallow dug wells from 15 to 25 feet deep or from drilled wells from 100 to 150 feet deep. The quality of the water is excellent, except in the shallow wells near seeped areas. No salty water is found in drilling, as the underlying shales which carry salt lie at a great depth.

The Wheatland tract was first extensively irrigated in 1883 by the Wyoming Development Co. which developed and sold both Carey Act and deeded lands previously obtained from the Government under the desert land act. A total of about 96,000 acres in these tracts is included in the final plans of the company. In addition to the Wheatland tract, which is all deeded land, two Carey Act projects are included, one at Bordeaux southeast of Wheatland and one west of Wheatland on the west side of Sibylee Creek.

The Carey Act land was sold at $40.50 an acre with perpetual water rights on a 7 or 8 year payment basis. Some deeded land sold for $40 or $50 and a few choice tracts brought from $60 to $150 an acre. Settlers of many nationalities came from various parts of the country. A number of the original settlers came from the dry-farming sections of Kansas and Nebraska. A few of the present farmers are from Iowa and from irrigated lands in Colorado.

Wheatland, the county seat of Platte County, has a population of 1,336, according to the 1920 census. It has all modern improvements and is a decidedly up-to-date town. Bordeaux is a small settlement on the Colorado & Southern Railway in the southeast corner of the area.

A part of the Yellowstone Highway, which passes through the area, is graveled and surfaced, but the side roads are mainly graded dirt. Owing to the scant rainfall, the roads are generally in good condition, but at times during rainy spells in spring and fall they become muddy and rough.

A good local market for vegetables, fruits, eggs, and farm products is afforded by the restaurants and hotels in towns in the area, especially in summer when tourist traffic is at its height. Cream is bought at the creamery in Wheatland and at two other stations. Many farmers ship cream and dairy products direct to Denver. Livestock products, including sheep, cattle, wool, and hides, are marketed at Denver, Omaha, and Chicago. Many range sheep are bought in November and fed on alfalfa until February, when they are marketed. Sugar beets are shipped to the factory at Fort Collins, Colo. Some alfalfa and grain are shipped.

CLIMATE

The climate of the Wheatland area is marked by wide seasonal variation in rainfall and temperature. In some years, fair crops can be produced without irrigation, in some years two irrigations are sufficient, and in other seasons as many as four irrigations are needed to produce a crop.

Table 1, compiled from records at Wheatland covering a period of 30 years, shows the normal monthly, seasonal, and annual temperature and precipitation in the area.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Wheatland*

[Elevation, 4,738 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1893)	Total amount for the wettest year (1912)	Snow, average depth
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	30.1	76	−34	0.70	0.70	0.34	9.1
January	28.6	69	−29	.62	.20	.98	6.9
February	28.1	74	−36	.66	.40	1.08	7.5
Winter	28.9	76	−36	1.98	1.30	2.40	23.5
March	34.0	84	−21	1.09	.50	1.25	8.8
April	45.3	91	−4	1.75	1.40	2.61	9.9
May	55.1	94	19	2.55	.90	1.04	1.7
Spring	44.8	94	−21	5.39	2.80	4.90	20.4
June	65.1	100	29	1.70	.10	2.03	.0
July	71.5	105	29	1.41	.55	4.58	.0
August	70.5	109	36	.81	.27	2.43	.0
Summer	69.0	109	29	3.92	.92	9.04	.0
September	61.0	99	18	1.11	Trace.	3.76	.4
October	48.9	92	−9	1.19	.60	2.04	4.4
November	38.1	86	−17	.58	.30	.44	5.3
Fall	49.3	99	−17	2.88	.90	6.24	10.1
Year	48.0	109	−36	14.17	5.92	22.58	54.0

The distribution of rainfall is most important on the east and north edges of the area, where dry farming is engaged in. The irrigated section is generally abundantly supplied with water regardless of the rainfall. Most of the rain comes in the spring and fall as local showers. At times hail does much damage to grain and alfalfa crops in some parts of the area. The path of the hailstorms is variable and erratic. Some farmers report no hail within 20 years, whereas others report hail having occurred three or four times in the last 15 years. During the last hailstorm, the greatest damage seemed to be along the foothills on the south and west sides of the area.

The average date of the first killing frost is September 25 and of the last May 14, giving an average frost-free season of about 134 days. This is long enough to mature good crops of corn and potatoes. Late planting, improper seed selection, poor cultivation, and improper handling of irrigation water cause delays and crop failures more often than do short frost-free seasons.

The grazing season opens in May and continues into November. The amount of winter feeding necessary to carry livestock during the winter depends largely on the character and amount of the snowfall. Heavy snowfalls, accompanied by little wind which would blow the snow away, make earlier and longer winter feeding necessary.

As the prevailing wind is from the west and the Wheatland area is on the east slope of the mountains, it is generally protected somewhat, although occasionally severe winds from the west and northwest are experienced both in summer and winter.

AGRICULTURE

The first agricultural development in the Wheatland area was begun by the Wyoming Development Co. in 1883. Cattle and sheep ranches had operated before this, and some irrigation had been attempted on the bottom lands along the rivers and creeks where wild hay was produced for cattle feed. The first settlers, who were mainly hunters and trappers, were followed by ranchers and stockmen in the late seventies.

Wheatland was founded in 1894, and Platte County was created by act of legislature and approved by Governor Carey February 9, 1911. The first lands were taken up by the ranchers along Chugwater Creek, Sibylee Creek, and Laramie River, where water was available for livestock. Gradual extension of irrigation led to the development of the adjoining sage-land benches, mainly for the production of alfalfa and grain. Cattle and sheep raising dominated the agriculture of the area until sugar-beet production began.

Dairying has met with greater favor in the last few years. The census for 1925 showed that nearly 3,000 dairy cows and heifers were kept in Platte County. In the year 1924,[1] Platte County reported a production of 1,512,750 gallons of milk, 6,398 gallons of cream sold, 273,280 pounds of butterfat sold, and 111,681 pounds of butter made on farms.

The acreage and production of the principal crops grown in Platte County are shown in Table 2.

[1] Unless otherwise stated, all production figures are quoted from the U. S. census reports.

TABLE 2.—*Acreage and production of principal crops in Platte County, Wyo., in stated years*

Crop	1919		1924		Crop	1919		1924	
	Acres	*Bushels*	*Acres*	*Bushels*		*Acres*	*Tons*	*Acres*	*Tons*
Corn	3,606	33,334	11,216	144,285	Sugar beets	277	1,701	2,026	18,419
Oats	2,493	32,719	8,362	162,689	Hay [1]	[2] 31,234	[2] 37,254	50,194	56,983
Wheat	19,740	108,823	14,779	155,993	Alfalfa	27,866	33,894	28,403	
Barley	636	5,982	781	10,617					
Rye	3,115	11,327	1,652	12,448					
Potatoes	677	29,124	238	12,252					

[1] Includes alfalfa. [2] Tame hay.

Agriculture in this area has included the production of hay, alfalfa, and grain, and the raising of livestock. A considerable acreage has been devoted to sugar beets in recent years. A survey of the income and expenses on farms near Wheatland by the United States Department of Agriculture through its Bureaus of Agricultural Economics and of Public Roads shows that about 50 per cent of the farms are operated by owners and 50 per cent by tenants. Of the owner operators, 46 per cent show a profit for 1924.

The farms in Platte County average 897.7 acres in size. (Pl. 1, A.) They include considerable dry pasture land, only half the farm being covered by water rights and only 40 per cent being actually in harvested crops in 1924. The average indebtedness amounts to one-fourth of the value of the farms and their equipment. The average rate of interest paid on borrowed money is 7 per cent.

The farmer having an equity of $3,000 in 1912 was found to have increased his valuation to $9,400 in 1924, most of this increase being due, as in other sections of the country, to increased land values. The average acre return varies greatly, depending largely on the management of the farm and the ability of the owner. The average return of farm owners in 1924 was $9 an acre; the farms showing losses had returns of $4 an acre; and those showing profits had returns ranging from $7 to $20 an acre. Livestock and livestock products furnish from 20 to 37 per cent of the total income, sugar beets from 16 to 33 per cent, grain from 10 to 18 per cent, hay from 10 to 18 per cent, dairy products from 4 to 10 per cent, and poultry from 3 to 8 per cent.

The largest items of expense are labor, interest on borrowed money, feed, and taxes. In sugar-beet farming, especially, the labor charge is high. In dairy farming or in sheep and cattle feeding, the expenditure for ground feed is apt to be large. Although many farmers produce most of the alfalfa and grain which is fed, the grain has to be ground. Many dairy farmers use beet tops for supplementary feed.

Dairying and livestock feeding are the agricultural activities which best maintain the fertility of the soil. Rapid reduction of the fertility of a farm results from raising grain exclusively for sale. On a number of farms, fat hogs contribute an important part of the farm income, and on these farms fairly large acreages of corn are grown. Some farmers make a specialty of raising corn for sale to local livestock feeders. Others engage in livestock farming, with sugar beets as a side line.

Although the sugar-beet industry is still in its infancy, the acreage of sugar beets has increased in recent years from 2,000 acres in 1924 to more than 4,000 in 1926. Many farmers in the Wheatland area, being unfamiliar with the requirements of the crop and with the use of irrigation water, have met with little success. Others have begun to reap large profits. Yields range from 6 to 18 tons to the acre, averaging 13 tons. Thorough cultivation, irrigation at the proper times, rotation of crops, and manuring to keep up soil fertility are very important in the production of sugar beets, which have a very restricted root system and require a highly fertile soil and uniform moisture conditions.

Platte County ranks third among Wyoming counties in the production of corn. A fairly early hardy acclimated variety with a short stalk is grown on the dry-farmed land. Yields are low. The seed is generally saved from year to year, little attention being paid to systematic seed selection. Some farmers claim to have grown corn on the same land for years without decrease in yields. Droughts, hailstorms, and dry winds frequently damage the corn crop. Better varieties of corn are grown on irrigated land and more attention is paid to rotation of crops. The corn is fed to cattle, hogs, horses, and sheep, and is in demand by all stockmen. Some farmers produce corn for sale to the sheep feeders. In irrigated areas, corn can be grown on all but the most stony or gravelly soils. Under dry-farming conditions, the sandy loam soils and land in draws on gentle slopes or in the bottoms of depressions where moisture conditions are better seem best suited to the crop.

Platte County ranks fourth in the State in production of wheat, yields of which average 16 bushels to the acre. Wheat does best, under irrigation, on the heavier loam and silt loam soils. Yields ranging from 30 to 60 bushels are obtained on new land. A part of the wheat crop is shipped to outside markets.

Platte County ranks fourth in the production of oats, which yield an average of 31 bushels to the acre. On newly irrigated land yields ranging from 50 to 80 bushels have been reported. In general, this crop is less profitable than wheat or barley, but its large yields and the need of feed for horses and of ground feed cause it to be favored at the end of a rotation consisting of alfalfa, sugar beets or corn, wheat or barley, and oats.

Barley is grown almost entirely on irrigated land, and the yields averaged 30 bushels to the acre in 1924. Rye, with an average yield of 13 bushels to the acre, is grown both on dry-farmed and irrigated land. If seeded in late summer or fall, rye is a good cover crop for protecting sandy soil from the wind. It also produces considerable fall pasturage where other pasture land is inextensive.

Potatoes produce good yields. The acreage in this crop could well be extended, where the haul to market is not too great, especially on the fine sandy soils which are suited to cultivated crops. Potatoes grown on heavier soils where large quantities of water are used do not have so good keeping and cooking qualities as potatoes grown on red sandy soils under dry-farming conditions. Yields ranging frm 125 to 200 bushels to the acre have been obtained, and the price during the last two years has been such that the acre returns have been large. However, most farmers in the Wheatland area grow only enough potatoes for home consumption.

The acreage devoted to hay is large. Alfalfa is the chief hay crop. It is generally stacked in the field and baled for shipment or is fed to cattle direct from the stack. Sometimes it is hauled to feeding pens for feeding sheep during the fall and winter. Alfalfa requires irrigation for its best development, although in favorable spots a fair crop may be grown on dry-farmed land or by the use of one irrigation to supplement the rainfall. Wild hay is produced on the moist bottom lands which are subject to overflow, receive seepage from higher irrigated land, or are irrigated by diversion of water from the streams along which they are located. This hay also is stacked in the field and fed from the stack or is hauled to pens and fed to cattle and horses. Some ranchers consider the wild hay superior to alfalfa hay as feed for young sheep or steers during the winter.

Horses are still the main source of motive power. The few tractors seen in the Wheatland area are used chiefly for belt work.

Russian thistle or tumbleweed is the most abundant and harmful weed. It grows in cornfields and on any vacant piece of land where the sod has been broken. In fall the large dried plants, some of them from 2 to 4 feet in diameter, accumulate in piles against the fences and clog the irrigation canals and ditches. Pigweed and dwarf sunflower also accumulate on the canal banks and along the fence rows.

The ease and rapidity of water distribution, governed by character of the land, are more important factors in agricultural success than is the texture of the soil. Some level stony and gravelly areas which are not well suited to cultivated crops require large amounts of water. Drainage conditions and cheap water regulate the distribution of the wild-hay crop. This is grown on the older irrigated meadows and wet bottom lands along the streams. Alfalfa requires better drainage and is adapted to the calcareous loam soils of the higher benches. Sugar beets do very well on well-drained bottom lands or slightly seeped areas where small or moderate amounts of alkali salts have accumulated in the soil, as well as on the upper bench lands.

Commercial or mineral fertilizers are not used, but some stable manure is applied to the land, especially by the more successful sugar-beet growers. The supplies of nitrogen and organic matter in the soil are fairly well maintained in the alfalfa fields, despite the removal of the hay. A few farmers practice green manuring by plowing under sweetclover. Most farmers, however, still farm on the assumption that the fertility of their soil is inexhaustible and that variations in their crop yields are owing to vagaries of the weather rather than to depleted fertility or poor seed-bed preparation.

Farm laborers on the large ranches include men employed for herding sheep or handling cattle and riding the range. On the sugar-beet farms, Mexican labor is employed. The grower makes a contract through the sugar company for labor by the acre. The laborer receives from $22 to $25 an acre for all hand labor on the beets, such as thinning, hoeing, pulling, and cutting off the tops. One laborer handles from 5 to 10 acres of beets. Whole families of Mexicans work in the fields. A small frame shanty or house is furnished them for living quarters.

Farm improvements are fairly good, and the use of labor-saving machinery is widespread. There is generally a good supply of

farm horses. Most of the buildings are small, the houses generally one story high. The barns, except on the dairy farms, larger ranches, or places where large numbers of sheep and young stock are fed, are also small. On most farms it is customary to let machinery stand outside without shelter. Consequently breakage and depreciation of machinery is much greater than is necessary. Wire fences are in universal use. Most farms are laid out in square or rectangular fields, which are most convenient for crop rotations. Large canals and ditches necessitate many bridges. Weeds, which are likely to accumulate along canals and hedges, are generally burned either in late fall or early spring.

The price of land has fluctuated considerably during the last 10 years. At present land may be bought at prices ranging from $40 to $75 an acre, although the price for this same land has been much higher. Specially well-located farms are still held for about $100 an acre.

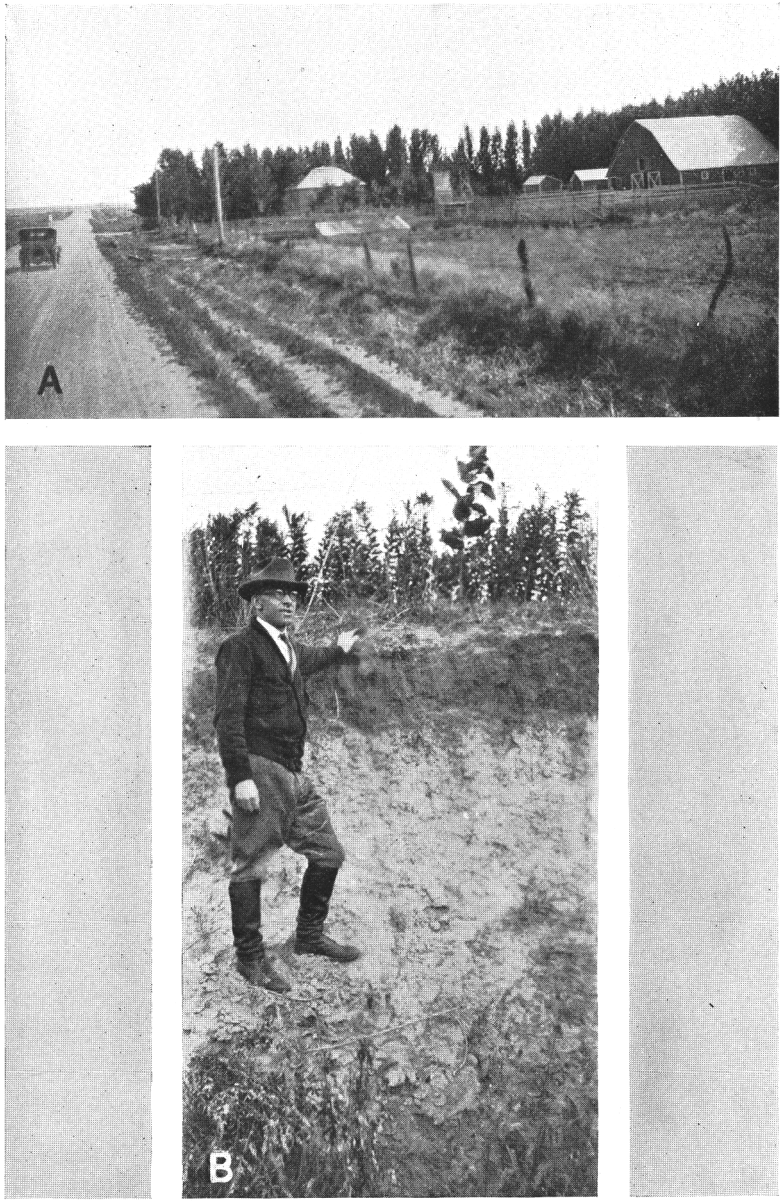
SOILS

The soils of the Wheatland area have been differentiated into a number of series and types on the basis of their physical and chemical characteristics as far as these could be readily determined in the field. The characteristics of the soils of any region are the result of two principal factors, the character of the parent rock from which the soils have developed and the processes of soil formation, including leaching, aeration, and oxidation, to which the soils have been subjected during their development. The soil-forming processes are controlled to a large degree by climatic conditions, particularly those which determine the supply of available soil moisture. The soils in this area, as in other dry regions of the northern Great Plains, owe their important characteristics to climate.

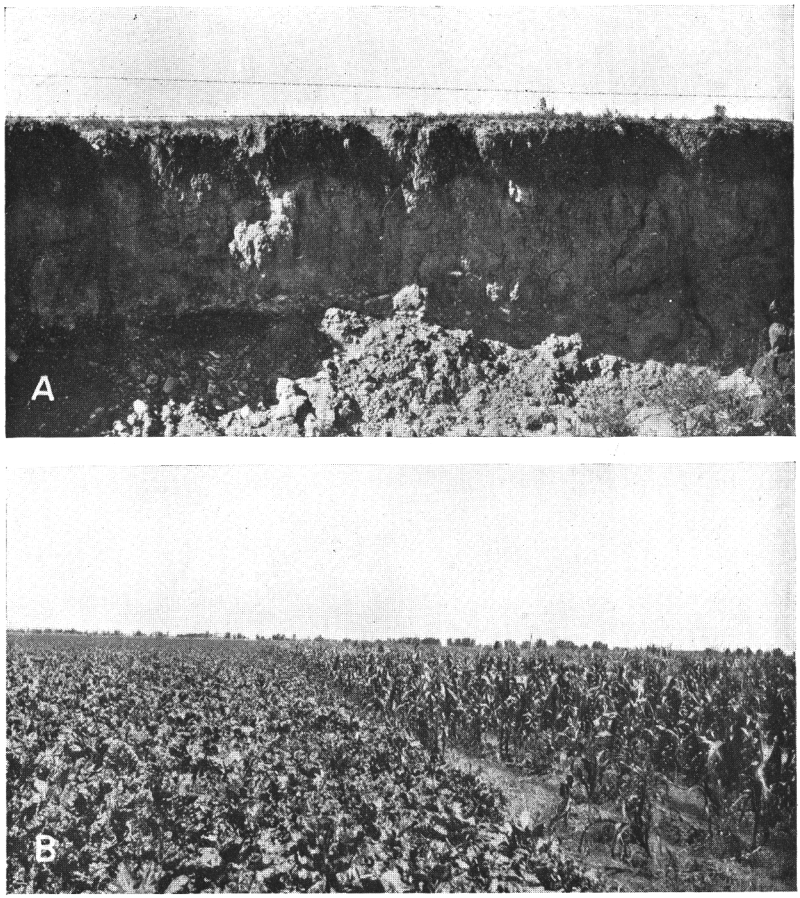
No chemical analyses of soils from this area have yet been made, but in general their chemical composition is known. Some of this information, such as that regarding the abundance of lime carbonate near the surface, has been obtained from observations within this area, and actual chemical data have been accumulated from the study of essentially identical and closely similar soils in the region. It is a well-known principle, established by chemical and field studies of soils in the United States and other parts of the world, that mature soils developed under very similar climatic conditions vary little in chemical composition within the same texture range. By this is meant that the sandy loams, clay loams, or any other texture group in any spot in a given region are much like those at other spots in the same region.

It can be said, therefore, that Fort Collins loam and Fort Collins fine sandy loam, the principal soils in this area, are well supplied with lime and potash. The supply of phosphorus and nitrogen is good, but is not sufficient to warrant wasteful methods in agriculture. The percentage of potash will range around 2.25, of lime around 1.75, of phosphorus around 0.14 per cent, and of nitrogen around 0.1 per cent. These percentages, as compared with the percentages of these constituents in the soils of the United States as a whole, are good but are not excessively high.

The moisture supply of this region is not sufficient to favor the accumulation of any large amount of organic matter in the surface



A, Ranch on highway 9 miles north of Wheatland; B, typical profile of soils in the Wheatland area



A, Profile of Fort Collins loam; B, sugar beets growing on Fort Collins loam, 3 miles west of Wheatland

soil, notwithstanding the fact that the native vegetation consists of grasses. As a result of the low organic-matter content, the soils range in color from grayish brown to dark grayish brown. As the rainfall of the region is not sufficient to leach the soils to any great depth the carbonates and other soluble compounds, which are removed from the surface layers, are abundant in the subsoils.

The well-drained upland soils have reached a stage of weathering and a uniformity of development over large areas that may be regarded as mature for this climatic belt. The profile of the deeper soils (pl. 1, B) shows the following typical layers: (1) A loose grayish-brown mulchlike surface layer rarely 1 inch thick; (2) a compact brown or dark grayish-brown heavier-textured layer; (3) a brown or grayish-brown layer with high lime concentration; and (4) the slightly altered parent material.

The soil-forming processes have been controlled in a general way by the regional climatic conditions, but the intensity of their action has varied with local topographic and drainage conditions and the length of time they have acted without interruption. The profile described develops where the soil-forming processes have acted without interruption, as on smooth, well-drained areas where the soil, having weathered as deeply as the moisture supply will allow, has accumulated organic matter. This profile has been best developed in the Fort Collins soils on the well-drained terraces.

On eroded areas the darker leached surface layer has been removed almost as rapidly as it has formed. The soils are lighter in color and the unleached layer, with its high lime content, is near the surface and in many places is exposed. Soils of this kind have been placed in the Bordeaux and Dwyer series.

Soils of another group, which have not developed the regional profile on account of excessive moisture or recent deposition of the material, occupy the lower stream bottoms or depressions on the higher land. The character of these soils is governed largely by the composition of the sediment from which they were derived. As the streams carry sediments of a variety of textures, recent alluvium is a complex material. Weathering under conditions of excessive moisture and the accumulation of organic matter have wrought many changes in the material, and in some places productive soils have been developed. Lighter-colored flood-plain soils of this character have been classed in the Laurel series. The dark-colored soils of the depressions at the heads of streams have been classified as dark-colored phases of the Laurel group. Where climatic conditions were most favorable and where erosion has not thinned the soils other forces have retarded development. The parent rock has not been broken down thoroughly and in many places it underlies a thin soil.

The parent material from which the soils lying west of Chugwater Creek are formed is a mixture of sand, silt, and clay derived largely from the disintegration of granitic rocks in the Laramie Mountains. This material, broken loose in the mountains by frost, ice, and water, was carried down by streams, mixed with more or less gravel and cobblestones, and deposited as an outwash-fan blanket from 4 to 25 feet thick over the Arikaree and Brule rock formations which underlie the soils of the area. On these deposits were developed the Fort Collins soils.

93268—30——2

In certain places this blanket of granite waste was thin or has since been removed by erosion so that the present soil has been produced by the weathering of the Arikaree formation. This is largely true of the soils east of Chugwater Creek, north of Fish Creek, west of the junction of Sibylee Creek and Laramie River, and near the junction of Sibylee and Bluegrass Creeks. In these areas, the soils have a lighter-brown or grayish color rather than the chocolate-brown or rust-brown color of the soils between Chugwater and Sibylee Creeks. The Arikaree sandstone from which the lighter-gray soils are produced is a fine grayish calcareous sandstone which weathers into fine sand and fine sandy loam. Variations of structure and texture in these soils are due to the varying character of the rock and to the different stages of weathering caused by topographic position and extent of erosion. Where erosion has been rapid the soil is shallower, the zone of lime accumulation is absent, and the color of the soils is similar to that of the underlying rock. These soils are placed in the Dwyer and Bordeaux series.

The soils of the Wheatland area are grouped into series, all the members of each of which have at least one common characteristic. This similarity may be the result of weathering, of the composition of the parent material, or of some other factor. The soils of each series are subdivided into types on the basis of the texture of the surface soil or the proportions of sand, silt, and clay of which it is composed. Within the soil types there are also variations. Where these are sufficiently well defined and important, they are indicated as phases of the soil type.

The surface layer of the soils of the Fort Collins series, to a depth ranging from 1 to 2 inches, is grayish-brown, loose, friable, mulch-like material. This loose layer, which can be seen only in the virgin soil, is the result of a process of deflocculation, but the surface soil is also more or less reworked by the wind. The next lower layer, which is heavier in texture, has a rich dark grayish-brown color. It is the layer of maximum compaction and in most places is columnar in structure. The lime-carbonate content is low. In most places a few rock fragments are scattered through the material. Below a depth ranging from 8 to 12 inches there is a gradual change to grayish-yellow silty loam specked and streaked with white calcareous material. This layer, which begins at a depth of 16 inches, is structureless except in the upper part where there is an indistinct columnar structure. It is the layer of highest lime content and apparently of lime accumulation. A few stone fragments and waterworn gravel are scattered through it. Below a depth of about 36 inches is a bed of sand and gravel, in most places loosely cemented by lime. The gravel consists of fragments of both igneous and sedimentary rocks, with some limestone. This gravel bed is underlain at a depth of 4 or more feet by a heavy layer, in most places of clay loam. The loam, fine sandy loam, and silty clay loam members of the Fort Collins series are mapped.

The Larimer soils are characterized by brown or grayish-brown surface soils, slightly darker-brown upper subsoil layers, and grayish-brown gravelly deeper subsoil layers. Fine gravel and bowlders are abundant on the surface and are embedded in both the

surface soil and subsoil materials. These soils occupy old outwash fans, the material of which has been transported by streams from the mountains and spread over the plains. Larimer gravelly loam, with a stony phase, is mapped.

The surface layer of soils of the Bordeaux series is typically light grayish brown, the color depending on the age of the soil. On eroded areas the color is lighter and in places has a pinkish cast, but where the surface soil has been undisturbed for a long time the color is light grayish brown. The surface layer varies considerably in thickness and grades almost imperceptibly into the subsoil. In places it is 12 or more inches thick. The subsoil, which continues to a depth of 30 inches, is very light grayish brown, in places taking a pinkish color from the parent rock. The surface soil is commonly calcareous, and the subsoil is everywhere highly calcareous. The parent rock from which the soil has weathered is light-colored highly calcareous sandstone or shale. A few fragments of the parent rock occur in the surface soil and more are in the layer below. The unweathered rock in most places occurs below a depth of 30 inches. Bordeaux very fine sandy loam is mapped.

The surface soil of members of the Dwyer series is light-brown or grayish-brown material, from 7 to 10 inches thick, which is slightly darker than the subsoil on account of its organic-matter content. In most places the surface soil has been leached of lime. The underlying layer, which may reach a depth of many feet, is light grayish-brown calcareous sand. Areas of the Dwyer soils are uneven, and apparently the material was wind laid. These soils occur on slopes below exposures of sandy formations. They differ from soils of the Valentine series in their slightly lighter color and in their lime content. Dwyer fine sand, with a loamy phase, is mapped.

The well-drained soils of the Laurel series occupy the lower bottom land along all the larger streams. Typically they have grayish-brown surface soils and lighter-colored subsoils. They are kept wet during part of the year, partly by seepage from the uplands and partly by spring floods when the streams overflow their banks. The dark-colored and poorly drained soils of the higher bench lands have been classed as dark-colored phases of the Laurel soils. They occupy slight draws or flats, principally at the margins between two bench levels where seepage from the higher level comes down through the gravelly subsoil to the bench below. Here poor drainage develops, more or less alkali salt accumulates, and organic matter has accumulated, causing the darker color. Well-drained phases of Laurel fine sand and Laurel fine sandy loam and dark-colored phases of Laurel fine sandy loam, Laurel loam, and Laurel silty clay loam are mapped.

The classification rough broken and stony land includes all land too rough, stony, gravelly, and steep for cultivation. Rock ledges, outcrops, and steep gravelly slopes leading from one bench level to another constitute most of this class of material.

In the following pages of this report, detailed descriptions of the soils of the Wheatland area are given; their distribution is shown on the accompanying soil map; and their acreage and proportionate extent are given in Table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in the Wheatland area, Wyo.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Fort Collins loam	60,288	25.7	Laurel silty clay loam, dark-colored phase	4,736	2.0
Fort Collins fine sandy loam	16,064	6.9	Bordeaux very fine sandy loam	5,760	2.5
Fort Collins silty clay loam	13,376	5.7	Larimer gravelly loam	30,464	15.7
Laurel fine sandy loam, dark-colored phase	10,432	4.4	Stony phase	6,336	
Laurel fine sandy loam, well-drained phase	11,008	4.7	Dwyer fine sand	2,240	5.0
Laurel loam, dark-colored phase	5,888	2.5	Loamy phase	9,344	
Laurel fine sand, well-drained phase	11,456	4.9	Rough broken and stony land	46,848	20.0
			Total	234,240	

FORT COLLINS LOAM

Fort Collins loam is the principal soil in the irrigated part of the Wheatland area. This soil overlies water-laid materials that vary widely in texture and composition. The surface soil on the flat terraces, however, has weathered for so long a time that remarkably uniform soil material has been formed. The soil has a well-developed profile (pl. 2, A), that is, layers have been developed which, though they may vary in thickness, are well defined throughout the soil.

A typical section of this soil observed about 2 miles northeast of Wheatland showed the following layers from the surface downward: (1) From 0 to 1 inch, grayish-brown loose mulchlike fine sandy loam; (2) from 1 to 8 inches, dark grayish-brown loam containing much very fine sand and indistinctly columnar in the lower part; (3) from 8 to 16 inches, the heaviest and darkest layer of the soil, consisting of heavy rich dark grayish-brown somewhat compact indistinctly columnar loam in which the columns are about one-half inch in diameter; (4) from 16 to 26 inches, grayish-yellow fine sandy loam of faint columnar structure in its upper part, containing small spots and streaks of white lime carbonate and forming the layer of highest lime-carbonate content; (5) from 26 to 36 inches, structureless firm or slightly compact grayish-yellow fine sandy loam, containing fewer specks and streaks of lime carbonate than the layer above; and (6) below a depth of 36 inches, sand and gravel composed of more or less waterworn igneous and sedimentary rocks, together with a few limestone rocks, loosely cemented by lime carbonate. Nearly all the rocks are partly coated and some are completely covered with lime carbonate. More or less fine interstitial material is present in this layer.

All these layers may vary in thickness. The gravelly layer may be very thin. In places it is underlain at a depth of 4 or more feet by grayish-brown clay or clay loam. Fort Collins loam was derived mainly from débris brought down from the mountains. The material was spread as a blanket over these plains or benches by the flood waters of the mountain streams.

Fort Collins loam occurs principally on the high benches between Chugwater and Sibylee Creeks, surrounding Wheatland. Most of the land is nearly level, but small areas are undulating. The nearly level land requires a minimum of leveling which simplifies the laying out of fields and the construction of ditches and canals for irrigation.

From 50 to 60 per cent of this soil is cultivated. Although nearly all of it could be irrigated, some land lies fallow, some is kept for pasture, and some has not yet been developed. The native vegetation is prairie grasses and short sage. Pasturage is very good, especially in the spring and fall. The chief crops are alfalfa, sugar beets (pl. 2, B), and grain. Alfalfa produces from 2½ to 4 tons, sugar beets from 8 to 16 tons, and wheat from 30 to 60 bushels to the acre. Under irrigation corn yields from 25 to 50 bushels, barley from 35 to 50 bushels, and oats from 50 to 80 bushels to the acre.

Rotation is practiced only in a general way, old alfalfa fields being broken up for corn or sugar beets, which are followed by grain, after which the land is returned to alfalfa. No fertilizers other than barnyard manure and small amounts of superphosphate (acid phosphate) are used, as the soil has not yet lost its virgin fertility. On a few farms it was noticed that a crop of green sweetclover was being plowed under.

Land sells for prices ranging from $40 to $100 an acre, depending on location and the character of the improvements. Some small-fruit and truck-garden ranches near town are held at higher prices.

Fort Collins loam is probably the most desirable soil for irrigation farming in the Wheatland area, because it is not too heavy for easy cultivation, has good water-holding capacity and a good store of plant food, and does not require so much water and so frequent irrigation as the more sandy soils. Partly because of the calcareousness of the subsoil alfalfa is very successful on this soil.

FORT COLLINS FINE SANDY LOAM

Fort Collins fine sandy loam does not differ greatly from Fort Collins loam except in the larger percentage of fine sand in the surface soil and in most places throughout the soil. The same layers occur, but they are not so sharply defined as in the loam. A thin mulch layer covers the surface and is underlain by a fine sandy loam layer. The brown rather compact layer is developed but not so strongly as in the loam. The next lower layer is that of lime accumulation. Yellowish-brown gravally fine sand occurs below a depth of 40 inches.

Fort Collins fine sandy loam occurs in rather scattered areas, the largest ones lying between Laramie and North Laramie Rivers. It occupies level well-drained high benches.

This soil is largely under irrigation and perhaps one-half of it is used in the production of cultivated crops, principally alfalfa, corn, oats, and wheat. Fair yields are obtained, although they are somewhat less than on the heavier soils. Alfalfa produces from 2 to 3 tons, corn from 25 to 40 bushels, oats from 40 to 60 bushels, and wheat from 25 to 30 bushels to the acre.

The soil is easy to cultivate, as it contains few stones or gravel. Owing to its openness, it absorbs water rapidly and requires frequent irrigation. When dry farmed, it has a tendency to blow if left bare and exposed to heavy winds.

With proper management, having in view the maintenance of the supply of organic matter in the soil, this land should produce good crops of potatoes, beans, peas, berries, small fruits, and vege-

tables. It is a warm early soil and suitable for intensive cultivation. Good alfalfa can be grown, and this crop should be used to maintain soil fertility.

FORT COLLINS SILTY CLAY LOAM

Fort Collins silty clay loam has the same general characteristics as the other soils of the Fort Collins series except that the texture to a depth of 15 inches is much heavier. The loose, floury surface mulch is less than an inch thick and is lighter in color than the underlying layer, which is rather dark-brown silty clay loam. The compact layer, below a depth ranging from 6 to 12 inches, is rich dark-brown compact silty clay loam underlain by grayish-brown or light-gray calcareous loam or silt loam. Gravel and cobblestones are abundant between depths of 4 and 6 feet.

This soil occurs almost exclusively in the southeastern corner of the area. It occupies generally level high terraces or outwash plains which have, however, been eroded and cut by streams so that undulating and steep slopes occur.

Fort Collins silty clay loam is underlain by a bed of coarse conglomerate, thick blocks of which crop out on some of the steep eroded slopes. The position of areas on top of this consolidated conglomerate bed would indicate that the soil has been formed by the weathering of the conglomerate in place. The conglomerate parent material represents older and loosely consolidated material brought down by streams from mountainous areas to the west.

Perhaps between one-quarter and one-third of this soil is cultivated. The small proportion in cultivation is partly owing to the fact that the land lies in a newly developed section from 10 to 20 miles south of Wheatland.

Fort Collins silty clay loam is a productive soil. The greater quantities of clay and silt in the soil render it heavy to cultivate and plow but they also increase the moisture-holding capacity. Because of its heavier texture, this soil is best suited to alfalfa hay and wheat. A large acreage is used for pasture. The land should produce good sugar beets, but as yet this crop is not grown in this part of the Wheatland area.

Wheat yields from 30 to 50 bushels, corn 40 bushels, alfalfa from 2½ to 4 tons, oats from 50 to 70 bushels, barley from 30 to 50 bushels, and sugar beets from 8 to 16 tons to the acre. No definite crop rotation except the common one of alfalfa, corn, and grain is practiced. The sale value of this land ranges from $40 to $75 an acre. The Yellowstone Highway crosses the area occupied by Fort Collins silty clay loam, and good roads to Chugwater and Wheatland pass over it. Bordeaux lies on the eastern border of this soil.

LAUREL FINE SANDY LOAM, DARK-COLORED PHASE

Laurel fine sandy loam, dark-colored phase, includes a variety of soil materials which range widely in texture and color. The composition of the soil is being changed so rapidly by erosion and the deposits borne by flood waters that only a very general description of the material can be given.

A section of this soil, exposed about one-fourth mile north of Wheatland, showed the following layers: (1) From 0 to 9 inches, structureless grayish-brown or gray loose fine sandy loam; (2) from 9 to 36 inches, more compact grayish-brown fine sandy loam in which are embedded waterworn gravel ranging up to 2 inches in diameter; and (3) from 36 inches to an undetermined depth, calcareous and alkaline loose fine sandy loam which contains some gravel but not so much coarser material as the overlying layer. This profile may change within a short distance. The surface layer may contain pockets of fine sand and gravel or thin alternating strata of fine sandy loam, sand, and gravel.

The subsoil is nearly everywhere stratified, and the different thin layers vary widely in composition. In places, the surface soil contains large quantities of organic matter which imparts a dark grayish-brown or deep-black color. In such areas a highly calcareous layer about 10 inches thick begins at a depth of about 24 inches below the surface. In other places beds of loose sand and gravel underlie the soil material at a depth of 48 inches.

This soil has little value for farming and is used only for pasture land.

LAUREL FINE SANDY LOAM, WELL-DRAINED PHASE

The surface soil of the well-drained phase of Laurel fine sandy loam, to an average depth of 8 inches, consists of grayish-brown fine sandy loam. In places the surface layer to a depth of 1 inch is lighter colored, loose, and powdery and forms a mulch similar to that on the Fort Collins soils but not so well developed. Below the surface soil and continuing to a depth of 30 inches is a grayish-brown fine sandy loam or very fine sandy loam stratified layer in which the thin strata are variable in texture, consisting chiefly of all grades of sandy loams but predominantly of fine sandy loam. Below a depth of 30 inches the material is variable in texture, ranging from sandy loam to fine sand. In places gravel strata may alternate with strata of heavier material. The color is grayish brown or yellowish brown.

This soil occupies level, well-drained terraces along the streams. The areas occur as narrow strips elevated from 3 to 10 feet above the first bottoms along Chugwater Creek, Sibylee Creek, and Laramie River.

This soil is so located that almost all of it can be irrigated. Practically all of it is in crops, chiefly alfalfa, wheat, oats, sugar beets, corn, and barley. Alfalfa yields from 2½ to 4 tons, corn from 40 to 50 bushels, wheat from 30 to 60 bushels, oats from 40 to 70 bushels, and sugar beets from 8 to 16 tons to the acre.

Although the soil is not very extensive it is one of the best agricultural soils of the area. On account of its position along the streams, land of this kind was among the first to be cultivated by the large stock ranchers who came into the country previous to general irrigation around Wheatland.

LAUREL LOAM, DARK-COLORED PHASE

The 8-inch surface soil of the dark-colored phase of Laurel loam is dark grayish-brown or almost black loam or silty clay. This ma-

terial passes gradually into dark-gray plastic silty clay loam which continues to a depth of 36 inches. The surface soil is not calcareous, and the subsoil is rarely so. In most places below a depth of 36 inches, sandy and gravelly loams, which are commonly calcareous, occur. This soil is not uniform over any large areas. The content of organic matter in the surface soil varies widely, in places the proportion being so large that the material to a depth of 4 or 5 inches is muck. Mucky layers of varying thickness but in most places less than 1 inch thick may occur at any depth within 3 feet of the surface. Only slight indications of alkali are present in areas of this soil.

This soil has been formed over sediments which were washed into depressions from the higher ground. Successive soils have been covered by later-deposited sediments. The poorly drained condition of the areas has favored a rank growth of weeds and grasses and this has produced the buried muck layers. This soil occurs as narrow strips in various parts of the area, the largest tracts being from one-half to 1 square mile in extent. Areas occupy poorly drained flats and draws on the terraces which receive seepage and waste water from the irrigated land on slightly higher levels. Some of the areas are on the borders of ponds, and others follow low shallow drainage channels. Much of the soil can be cultivated, although the water table may come within 12 to 24 inches of the surface during the irrigating season. The drainage is not sufficient for the profitable production of alfalfa, but sugar beets, oats, corn, and wild hay can be grown. Sugar beets do very well on the better-drained areas. Some of this land is used for pasture.

Parts of the seeped or poorly drained areas are entirely too wet to cultivate, approaching a marshy condition in places, especially in late summer and fall after the main irrigating season is past. In these places the surface soil is dark-gray or dark-brown mottled loam to a depth of 12 inches underlain by yellowish-brown loam which in turn is underlain by grayish-drab mottled loam or fine sandy loam. The subsoil is highly calcareous. The color of the surface soil ranges from gray to black, depending on the amount of organic matter present. In dry weather, a crust of salts may be seen on the surface in some places. Land of this kind can be used only for pasture, as it is too wet for cultivation.

This soil could be drained by means of open ditches or tile, since the fall is ample. The poor drainage is entirely due to water lost from the canals or to seepage and waste water from surrounding higher irrigated land. The salts could be removed by the use of fresh irrigation water after suitable outlets have been provided. To thoroughly drain this land it would be necessary to first protect it from seepage by marginal ditches designed to cut off surface as well as subsoil water.

The Wheatland area is favorably situated, as the underlying rock strata of the Arikaree formation contain much lime but very little alkali salts. Any ordinary method of handling irrigation water will not cause a rise of alkali over large areas, as is the case where shale rocks containing alkali underlie the surface soil.

LAUREL FINE SAND, WELL-DRAINED PHASE

The surface soil of Laurel fine sand, well-drained phase, is grayish-brown fine sand from 10 to 12 inches thick. It is underlain by light-brown or yellowish-brown loamy fine sand continuing to a depth of 20 inches, and this layer in turn is underlain by grayish-brown loamy calcareous fine sand which extends to a depth of 48 inches. In places, the grayish-brown surface layer rests directly on the grayish-brown calcareous subsoil layer. The soil is somewhat variable, owing to the fact that it consists of a variety of materials transported by water and wind from their place of origin in the foothills of the Arikaree formation to the valley slopes. The surface soil has been leached of lime, but the subsoil is highly calcareous.

The largest bodies of this soil occur on the valley slopes along Chugwater Creek at the east side of the area and on slopes bordering Fish Creek, Laramie River, and North Laramie River. The relief is gently sloping or rolling. Some areas near the streams are nearly level and slope gently back to the ridges and foothills at the valley border where undulating or rolling breaks lead up to higher benches or plains.

For dry-farming purposes, this soil is of low agricultural value because of its low water-holding capacity and fertility. In areas where small canals from Chugwater Creek have brought water to it, however, very good crops of alfalfa are grown. Oats, corn, and potatoes also can be grown. On account of the looseness of the surface soil and subsoil large quantities of water are required.

LAUREL SILTY CLAY LOAM, DARK-COLORED PHASE

The dark-colored phase of Laurel silty clay loam, to an average depth of 11 inches, consists of dark grayish-brown or black silty clay loam. This is underlain to a depth of 40 inches by dark grayish-brown or dark-gray silty clay loam or stratified layers of fine sand, silt, and clay. Both surface soil and subsoil are calcareous, and in places alkali salts accumulate in quantities harmful to crops.

This soil borders the larger streams as wooded and grass meadow bottoms which vary from one-fourth to three-fourths mile in width along Chugwater Creek, Laramie River, and Sibylee Creek. The land is used for pasture and hay meadow in connection with ranching and livestock production. The bottom lands produce a good grade of wild hay which is stacked and fed to the animals in winter. In areas which contain too much alkali for hay production, the land is irrigated and pastured. On the somewhat elevated and better-drained areas sugar beets, corn, wheat, and alfalfa are grown. The main cultivated areas lie along the east bank of Sibylee Creek.

Areas are somewhat uneven in places and are so cut by sloughs and channels that irrigation is somewhat difficult. Nevertheless, a tract of this bottom land is considered a valuable addition to a farm, especially a stock ranch. Cattle and sheep are fed and pastured here in winter and spring, while snows are deep in the mountains, and are later driven to the forest reserves and mountains for summer and fall pasturing.

BORDEAUX VERY FINE SANDY LOAM

The surface soil of Bordeaux very fine sandy loam is light grayish-brown very fine sandy loam to an average depth of 12 inches. It is calcareous but low in organic matter. In eroded areas where the weathered soil is very thin over the parent rock, the surface soil is light gray with a pinkish tint. The subsoil between depths of 12 and 30 inches is light grayish-brown very fine sandy loam. This layer also has a pink tint in places, as it immediately overlies the pink Brule sandstone. It contains a large quantity of lime. The soil varies from place to place, depending on the depth to which weathering has taken place. In places, fragments of the underlying rocks are present on the surface, and in other places the surface soil has been eroded by wind or water, exposing the soft crumbly rocks beneath.

This soil occupies the gently undulating slopes on the margins of areas where the underlying Arikaree and Brule formations have not been covered with outwash material for a long time. Here weathering has produced a soil blanket over the calcareous rock. The relief is gently undulating, and drainage is good as the surface slope is sufficient to carry off surplus water. Very little of this soil is cultivated and practically none is irrigated. The native vegetation of short grass and sage furnishes good pasture, since the flat and depressed areas retain enough moisture for good grass growth.

Bordeaux very fine sandy loam is a good dry-farming soil. On the eastern edge of the area east of Bordeaux, large areas are devoted chiefly to corn, wheat, oats, barley, alfalfa, and potatoes. Sugar beets do well under irrigation in other localities but are not grown here. Corn produces from 15 to 25 bushels, wheat from 8 to 12 bushels, oats from 15 to 25 bushels, barley from 10 to 20 bushels, and potatoes from 50 to 100 bushels to the acre. Alfalfa does moderately well.

Land of this kind sells at prices ranging from $5 to $15 an acre for pasture and dry-farming land.

LARIMER GRAVELLY LOAM

Larimer gravelly loam includes the gravelly strips and all areas bearing cobbles and gravel which occur on the upper benches associated with Fort Collins loam. The surface soil consists of a layer of brown gravelly loam 7 inches thick. It is underlain by compact brown gravelly clay loam. The lower part of the subsoil between depths of 13 and 36 inches is calcareous gray sandy loam containing about 40 per cent of gravel. In areas of this soil north of Laramie River, the finer soil particles are fine sandy loam rather than loam, but the soil was included with Larimer gravelly loam because of its high gravel content.

The parent material of Larimer gravelly loam is outwash from the mountainous areas to the west. The flood waters on the higher slopes were too rapid for the deposition of fine material such as is found farther east on lower terraces. Some areas of this soil have been formed by the erosion of the finer surface soil materials, leaving the gravelly stratum, common to all these bench lands, exposed on the surface. Areas are generally smooth and do not require much leveling for irrigation and cultivation.

The largest areas of Larimer gravelly loam are in the west half of the Wheatland area, along Laramie River and Sibylee Creek, and between Laramie and North Laramie Rivers.

Only a small part of this soil, mainly those areas lying east of Sibylee Creek, is under cultivation. It is a productive soil, its only deficiency being its generally gravelly or stony texture which makes it less desirable for cultivated crops and irrigation. The same crops are grown as on Fort Collins loam. Wheat and alfalfa give the best yields. Wheat yields from 30 to 40 bushels, barley from 35 to 40 bushels, oats from 50 to 60 bushels, and alfalfa from 2½ to 4 tons to the acre.

Most of this soil is pasture land, the natural vegetation being prairie grasses and scattered short sage. The livestock industry consists of raising beef cattle which are sold as stockers and feeders. From 5 to 7 acres are required to pasture each steer.

The sale value of land of this kind ranges from $35 to $50 an acre. Some farms with good improvements and in good locations may bring higher prices.

Land of this kind requires more frequent irrigation and more water than the loam soils.

Larimer gravelly loam, stony phase.—The stony phase of Larimer gravelly loam includes all areas of Larimer gravelly loam in which the gravelly material is of cobble or bowlder size. This soil occurs on level well-drained terrace lands, but the cover of fine material is so thin and so many rocks are scattered over the surface and throughout the subsoil that it is practically impossible to plow, cultivate, or irrigate most areas. Owing to the action of water and ice most of the cobbles and bowlders are rounded. They are largely of granite and have been carried down by flood waters from the higher mountainous areas where only granitic rocks are found.

The largest tracts of this stony soil lie on the west edge of the area, principally along the north side of Laramie River. Most of the irrigated land is used for the production of hay and the dry land for pasture.

Land of this kind is not very valuable. It is perhaps worth from $5 to $10 an acre for pasture land. Where hay can be grown under irrigation or when sold in connection with better land, its value is somewhat higher.

DWYER FINE SAND

The surface soil of Dwyer fine sand consists of a layer of grayish-brown fine sand about 6 inches thick. Below this is a layer of light grayish-brown fine sand which is poor in organic matter and lighter in color than the surface soil. In places a slightly sticky layer occurs between depths of 10 and 18 inches. Below an average depth of 18 inches, the material is calcareous but no definite zone of lime accumulation is present. Where erosion has been rapid, the surface soil may be calcareous. Underlying the deeper parts of this soil, sandstone of the Arikaree formation occurs at a depth of about 36 inches. In eroded areas the soil covering is thinner and in places bedrock is exposed. As the organic-matter content of this soil is low, when the native sod is broken the sand drifts badly in the wind.

This soil occupies undulating areas on the slopes from the highest parts of the upland. The surface is hummocky and the upper part, at least, of the soil material appears to be wind laid. Areas are underlain by the Arikaree sandstones and shales, and it is probable that the soil material was originally derived from this formation.

This land lies at too high an elevation for irrigation, and part of it is dry farmed and part is used for pasture land. Alfalfa, oats, corn, and wheat are the chief crops. Yields are low, even in years of average rainfall.

Dwyer fine sand, loamy phase.—On the north side of Fish Creek are a few small areas of Dwyer fine sand, mapped as a loamy phase, in which the subsoil is very fine and slightly loamy, increasing the water-holding capacity of the soil and rendering it better suited to dry farming. Areas are undulating and occupy gentle slopes and draws between the bottom lands and the high bench and plains land. The soil is calcareous, being underlain by the bedrock of the Arikaree formation. Fair yields of corn, potatoes, wheat, and alfalfa are obtained without irrigation Yields are better than on typical Dwyer fine sand.

Land values range from $5 to $15 an acre.

ROUGH BROKEN AND STONY LAND

Throughout the Wheatland area are strips and patches of land so steep, stony, or gravelly as to be useless for cultivation. This land includes steep gravelly slopes between bench or terrace levels, rough stony land on the margins of the irrigated areas, and eroded gravelly or shaly slopes along stream valleys.

The largest areas of this rough land occur east of Ferguson Corners, in the southwest part of the area, south and west of Sibylee Creek, and in the northeastern part of the area.

Bordering Laramie River, rough broken and stony land includes stony slopes and ledges of the white Arikaree sandstone, which in places rise as high as 200 feet above the bottom lands.

This land is unsuited to cultivation and can be used only as pasture land. Most of the year, pasturage is very poor except in a few irrigated areas. Slight depressions, gullies, and narrow strips of bottom land associated with this rough land increase its value for pasture.

In a rocky area in T. 23 N., R. 69 W., considerable prospecting for copper, platinum, iron, and silver has been done. A small prospect called Grays Mine is still in operation in section 20 of this township.

ALKALI AND SOIL DRAINAGE

Alkali accumulation and seepage are not serious problems in the Wheatland area. Except in the bottom lands, these conditions are evident only in small scattered tracts. The accumulation of alkali salts is caused mainly by seepage from canals and by the high water table in local areas. Of samples collected in various parts of the area only one showed as much as 1 per cent of soluble salts present, and a few showed as much as one-half of 1 per cent. These determinations were made with a Wheatstone bridge. With a little care

in handling water and some expense for drainage, the control of alkali need never become a serious problem in the Wheatland area, because there is very little soluble salt in the subsoil or in the underlying rock formation.

Poor drainage of the swales and flat areas is due to a seasonal accumulation of water in the subsoils as well as to leakage from canals and dumping of waste water. Weekly readings, begun August 29, in holes dug in four poorly drained areas in different directions from Wheatland show a general rise of the subsoil water throughout the fall months, most of the water having been turned off in the canals before September 21. A small quantity of stock water runs till October 31. In spring the water is turned into the ditches between May 15 and May 20. These readings indicated that, in general, irrigation water is added to the Wheatland area soils at a faster rate than it can drain away. Therefore during the winter the subsoil is relieved of water which has accumulated during the summer irrigation period.

SUMMARY

The Wheatland area is in the southern part of Platte County, Wyo. It includes an area of 366 square miles or 234,240 acres.

The area surveyed is part of the high plains area, and the soil materials have accumulated, through erosion, from materials brought down from the Laramie Mountains.

Wheatland, the principal town, lies at an elevation of 4,738 feet above sea level. The area is sparsely populated.

The climate is semiarid. The average frost-free season of 134 days is sufficient to mature good crops of corn, potatoes, and other farm crops.

Farming is carried on both under irrigation and under dry-farming methods. Alfalfa, potatoes, sugar beets, and wheat are the principal crops grown under irrigation. Under dry-land farming the general farm crops are produced, but yields are not high. Dairy farming and livestock raising are important industries.

Soils in the Wheatland area have the general characteristics common to soils occurring in regions of light rainfall, being light in color, calcareous, and deficient in organic matter. Alkali accumulation in the surface soil is noticeable in only a few places.

The soils have been grouped in the Fort Collins, Larimer, Dwyer, Laurel, and Bordeaux series. Rough broken and stony land occupies about one-fifth of the area. The Fort Collins soils are the principal soils in irrigated parts of the area.

The sugar-beet industry, although still in its infancy, has increased in importance during the last few years, and it is recommended that a larger acreage be devoted to this crop.

○

[PUBLIC RESOLUTION—No. 9]

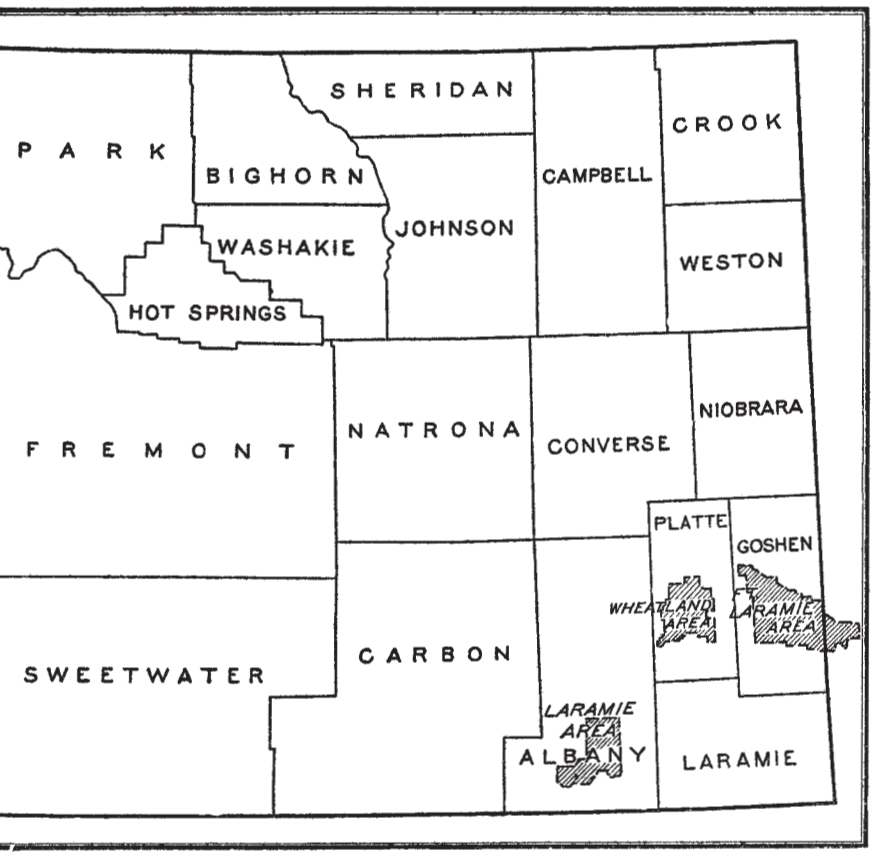
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture"

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in Wyoming, shown by shading

U. S. GOVERNMENT PRINTING OFFICE: 1930

Accessibility Statement

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at www.section508.gov.

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email Section508@oc.usda.gov. If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the USDA Section 508 Coordination Team.

Nondiscrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the

Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
A. G. McCALL, CHIEF, SOIL INVESTIGATIONS
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
WHEATLAND AREA
WYOMING

UNIVERSITY OF WYOMING
AGRICULTURAL EXPERIMENT STATION
J. A. HILL, DIRECTOR
A. F. VASS, HEAD, DIVISION OF AGRONOMY

R. 70 W. | R. 69 W. | R. 68 W. | R. 67 W.
105° 15' | 10' | 05' | 105° 00' | 55' | 104° 50'
T. 26 N. | 42° 10' | T. 25 N. | 05' | T. 24 N. | 42° 00' | T. 23 N. | 41° 55' | T. 22 N.

LEGEND

- Bordeaux very fine sandy loam — Bv
- Larimer gravelly loam — Lg
- Dwyer fine sand — Ff
- Lg — Stony phase
- Ff — Loamy phase
- Laurel fine sand, Well drained phase — L
- Fort Collins fine sandy loam — Fs
- Laurel fine sandy loam — Ll — Well drained phase
- Fort Collins loam — Fl
- Ll — Dark colored phase
- Fort Collins silty clay loam — Fc
- Laurel loam, Dark colored phase — La
- Rough broken and stony land — R
- Laurel silty clay loam, Dark colored phase — Ls

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort
- Secondary roads and Trails
- Railroads Steam and Electric (DOUBLE TRACK, SINGLE TRACK, SUPERPOSITION, IN ROAD)
- Bridges, Ferry
- R.R.crossings, Tunnel (R.R.ABOVE, R.R.BELOW)
- Ford, Dam
- School or Church, Cemeteries (CEM)
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines (STATE, COUNTY)
- Boundary lines (LAND GRANT, CITY OR VILLAGE)
- Boundary lines (CIVIL TOWNSHIP, RESERVATION)
- U.S.township and section lines

RELIEF
(Printed in brown or black)

- Contours, Depression contours
- Prominent Hills, Mountain Peaks
- Sand Wash and Sand dunes
- Shore and Low-water-line, Sandbar

DRAINAGE
(Printed in blue)

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.

DIAGRAM
Showing location of Area in Platte County

SQUAW MOUNTAIN

Thomas D. Rice, Inspector, District 3.
Soils surveyed by E. J. Carpenter, in charge, and E. G. Fitzpatrick, U. S. Department of Agriculture, and T. J. Dunnewald and Carl Pearson, Wyoming Agricultural Experiment Station.

BASE MAP IN PART FROM U. S. GEOLOGICAL SURVEY SHEETS

Scale 1 inch = 1 mile
1 | ½ | 0 | 1 | 2 | 3 | 4 Miles

WILLIAMS & HEINTZ CO. WASH. D.C.

Field Operations
Bureau of Soils
1926